Appl. No. **10 535 153**
Paper. dated March 25, 2011

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

SEO ET AL

SERIAL NO. 10 535 153 — **Art Unit:** 1796

FILED: MAY 16 2005 — **Examiner:** MULCAHY, P.

FOR: NETWORK SILICA FOR ENHANCING TENSILE STRENGTH OF RUBBER COMPOUND — Docket No: SHI 2480

Commissioner for Patents
Alexandria, VA 22313

SUBMISSION OF APPEAL BRIEF

Sir:

Appellant attaches an Appeal Brief appealing the Final rejection of claims 33, 36 - 41, 43, and 45 in the above application.

Appellant qualifies for small entity status. A check for $270 for the fee is also enclosed.

Respectfully submitted,

SEO ET AL

BY _____
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I hereby certify that this correspondence is being deposited with the United States Postal Service as first-class mail in an envelope addressed to: Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313
on this 25th day of March 2011

By _____

TABLE OF CONTENTS

REAL PARTY IN INTEREST

The application is unassigned so the real party in interest is the Appellant, Gon Seo.

RELATED APPEALS AND INTERFERENCES

There is no appeal, interference, or judicial proceedings known to Appellant or Appellant's legal representative which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

STATUS OF CLAIMS

Claims 33-64 are pending. Claims 1 - 32 were cancelled. Claims 33, 36 - 41, 43, and 45 are under consideration as being drawn to species elected by Appellant in response to a restriction requirement.

Non-elected claims 34, 35, 42, 44 and 46 - 64 stand withdrawn from consideration as being directed to non-elected species.

The Final rejection of claims 33, 36 - 41, 43, and 45 is being appealed.

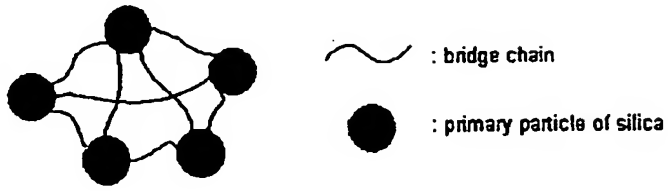
STATUS OF AMENDMENTS

No amendment was filed subsequent to final rejection.

SUMMARY OF CLAIMED SUBJECT MATTER

The claims are directed to a three-dimensional network of silica particles wherein the silica particles are connected by bridge chains. The network of silica particles effectively reinforces rubber compounds used in the manufacture of tires, belts, hoses, shoes, etc. by enhancing resistance to fatigue and significantly increasing tensile strength. The networked silica also has high dispersion in the rubber compounds and suppresses inactivation of other additives by masking absorption sites on the silica particles.

Figure 1 illustrates the three-dimensional structure of the networks formed by bridge chains between the silica particles:



The networks formed by the bridge chains between the silica particles prevents aggregation of the particles. The openings in the three dimensional network entangle rubber molecules and enhance the permeation among the silica particles resulting in improved resistance to fatigue and increased tensile strength. The enhanced permeation also improves the dispersion of the silica particles in the rubber compounds. The bridge chains attached to the surfaces of the silica particles change their surfaces from hydrophilic to hydrophobic.

The network of silica particles is produced by 1) reacting a1) silica particles functionalized with alkoxy silane coupling agents having functional groups with b) silica particles functionalized with alkoxy silane coupling agents having different functional groups so that the functional groups of a1) and b) are covalently bonded.

In the alternative, the network of silica particles can be produced by 2) reacting silica particles with an organic connecting material or 3) reacting silica particles functionalized with alkoxy silane coupling agent having functional groups with c) an organic connecting material having functional groups reactive with those of the coupling agent.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 33, 36-41, 43, and 45 stand rejected under 35 U.S.C. §102 as anticipated by or, in the alternative, under §103 as unpatentable over Tomihisa et al. ("Tomihisa").

In the Final rejection, the examiner stated that he was maintaining the rejections of the Office action mailed March 8, 2010. The examiner has taken the position that Tomihisa "discloses all of the limitations of a claim except a property or function, and the examiner cannot determine whether or not the reference inherently possess properties or function which anticipate or render obvious the claimed invention" (page 4, paragraph 10 of the Final rejection).

Apparently recognizing that the reactions recited in Appellant's claims are different from the hydrolysis/condensation reactions disclosed in Tomihisa, the examiner has taken the position that Tomihisa "teaches a product that appears to be the same as, or an obvious variant, of the product set forth in a product-by-proces claim although produced by a different process" (page 5, paragraph 12 of the Final rejection).

ARGUMENT

Group I: Claim 33

Rejection under 35 U.S.C. 102 (b) as anticipated by U.S. Patent No. 5,683,501 (Tomihisa)

The examiner's rejection under 35 USC 102 or, in the alternative, 35 USC 103 is based on the contention that Tomihisa "discloses all of the limitations of a claim except a property or function, and the examiner cannot determine whether or not the reference inherently possess properties or function which anticipate or render obvious the claimed invention" (page 4, paragraph 10 of the Final rejection). Apparently recognizing that the reactions recited in Appellant's claims are different from the hydrolysis/condensation reactions disclosed in Tomihisa, the examiner has taken the position that Tomihisa "teaches a product that appears to be the same as, or an obvious variant, of the product set forth in a product-by-proces claim although produced by a different process" (page 5, paragraph 12 of the Final rejection).

The examiner's rejection under 35 USC 102 is erroneous because the examiner did not provide objective evidence or cogent technical reasoning to support the conclusion of inherency

As will be discussed in detail hereafter, the examiner did not provide objective evidence or cogent technical reasoning to support the anticipation rejection ("In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990)).

Appellant submits that the examiner did not provide objective evidence because Tomihisa does not support the examiner's erroneous characterizations of the disclosure of the reference.

The examiner's primary bases for the rejections are that:

1) Tomihisa teaches "three dimensional networks of inorganic fine particles" (Final rejection, page 3, paragraph 7),

2) Tomihisa teaches polymer chains which "read on and anticipate the 'bridge chains' as claimed" because the polymer chains "have the same functional groups as claimed and be reacted with compounds having functional groups" (Final rejection, page 3, paragraph 7 citing col. 8, lines 54+ and col. 11, line 1+) and

3) Tomihisa teaches chains comprising carbon and hydrogen between the inorganic fine particles so as to form a three dimensional network (Final rejection, page 4, para. 9 citing col. 8, lines 54+).

The examiner did not provide cogent technical reasoning to support the conclusion of inherency

Appellant submits that the examiner did not provide adequate technical reasoning to support the conclusion of inherency as the basis of the anticipation rejection. The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993) and *In re Oelrich*, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981). "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.' " *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999).

As discussed in detail hereafter, Tomihisa does not make it clear that the inorganic fine particles (as opposed to the Si and O atoms) are in a three dimensional network. Tomihisa does not make it clear that the inorganic fine particles are connected by either the polymers or the bridge chains recited in Appellant's claims.

The examiner has not provided any technical reasoning 1) to support the conclusion that the reactants used in the processes in Tomihisa would result in Appellant's claimed network of silica particles or 2) to rebut Appellant's conclusion that Tomihisa's processes would not result in Appellant's claimed networks.

The disclosure of a genus in Tomihisa does not inherently disclose all species within that genus. *Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings*, 370 F.3d 1354, 1367, 71 USPQ2d 1081, 1091 (Fed. Cir. 2004) (explaining that "[a] prior art reference that discloses a genus still does not inherently disclose all species within that broad category" but must be examined to see if a disclosure of the claimed species has been made or whether the prior art reference merely invites further experimentation to find the species).

Since Tomihisa's disclosure does not support the examiner's characterization of the teachings therein, the disclosure does not support the examiner's conclusions. Tomihisa does not disclose all of the limitations of Appellant's claims, e.g., Appellant's three dimensional network of particles, the reactions or all of the reactants recited in the claims. However, the disclosure of Tomihisa does contain sufficient technical information which would enable the examiner to determine whether or not Tomihisa's products anticipate or render obvious Appellant's claimed products.

As shown in Appellant's Declaration (attached in the Evidence Appendix), review of the disclosure of Tomihisa, including the comparative examples, provides one skilled in the art with information to determine that Tomihisa's products do not possess either the properties set forth in Appellant's claims or the inherent functions of Appellant's claimed product. Furthermore, review of the reactions, reactants, and intermediate products disclosed by Tomihisa would lead one skilled in the art to the conclusion that the product of

Tomihisa does *not* appear to be the same as or an obvious variant of Appellant's claimed product.

The examiner did not provide adequate reasoning to support his contention that Appellant's Declaration was not "germane" to patentability

Appellant presented a Declaration based on Tomihisa's disclosure, including the examples, to rebut the examiner's contentions and to support Appellant's arguments with technical reasoning. In the Declaration, Appellant, as one skilled in the art, provides detailed technical reasoning rebutting the examiner's contention that Tomihisa discloses "three dimensional networks as claimed" and that the polymer chains "have the same functional groups as claimed and be reacted with compounds having functional groups". The Declaration also provides detailed technical reasoning to explain why the inorganic particles disclosed by Tomihisa are aggregated and not connected by chains comprised of carbon and hydrogen. Furthermore, contrary to the examiner's assertions, Appellant's claims recite all of the limitations which distinguish the claimed products from those of Tomihisa.

Appellants submit that the examiner's rejections must be reversed because the examiner did not adequately support his contentions that Appellant's Declaration was considered and "[T]he illustration of the hydrolysis and condensation reaction in the remarks and declaration is not germane to patentability". The examiner only repeats his conclusion that "[T]he three dimensional networked inorganic fine particles formed by this reaction are not patentably distinct from the three dimensional network as claimed" (paragraph 8 of the Final rejection) but does not provide any technical rationale for his position.

MPEP 2145 provides that:

> Office personnel should not evaluate rebuttal evidence for its "knockdown" value against the prima facie case, In re Piasecki, 745 F.2d at 1473, 223 USPQ at 788, or summarily dismiss it as not compelling or insufficient. If the evidence is deemed insufficient to rebut the prima facie case of obviousness, Office personnel should specifically set forth the facts and reasoning that justify this conclusion.

MPEP 716.01 provides that:

(B) Consideration of evidence . . . . Where the evidence is insufficient to overcome the rejection, examiner must specifically explain why the evidence is insufficient. General statements such as "the declaration lacks technical validity" or "the evidence is not commensurate with the scope of the claims" without an explanation supporting such findings are insufficient.

MPEP 716.01(d) provides that:

Facts established by rebuttal evidence must be evaluated along with the facts on which the conclusion of a prima facie case was reached, not against the conclusion itself. In re Eli Lilly, 902 F.2d 943, 14 USPQ2d 1741 (Fed. Cir. 1990).

The examiner has not disputed Appellant's detailed technical reasoning and/or conclusion that Tomihisa's reactants and reactions result in aggregated inorganic fine particles. The examiner has not provided any arguments as to why aggregated particles are not patentably distinct from Appellant's three dimensional networks as claimed. Since the particles are aggregated, the polymer chains cannot connect the particles whereas Appellant's claims require the bridge chains to form the three dimensional network by connecting the silica particles. Therefore the polymer chains are not "readable" on Appellant's bridge chains. In Appellant's claimed network, the bridge chains connect the silica particles and the network formed by the bridge chains prevent aggregation of the particles (paragraph [0020] and [0027]. As discussed hereafter, Tomihisa's particles are connected by Si - O or - M - bonding which does not include any carbon or hydrogen atoms. Contrary to the examiner's argument, the claims recite that Appellant's bridge chains connect particles, not atoms.

TOMIHISA DOES NOT DISCLOSE THREE DIMENSIONAL NETWORKS OF "INORGANIC FINE PARTICLES"

Tomihisa is directed to compound fine particles which "include inorganic fine particles and an organic polymer bound to the surfaces of the inorganic fine particles" (col. 4,lines 12-13). The compound fine particles are produced when an organic polymer containing at least one Si-OR1 group wherein R1 is hydrogen, an alkyl group, or an acyl group is hydrolyzed.

The hydrolyzed product is then condensed alone or with a hydrolyzed derivative of a metallic compound (G) (col. 4, lines 23+). The list of possible compounds for (G) in col. 11 does not include silica (SiO_2) particles or silica particles functionalized with alkoxy silane coupling agent recited in Appellant's claims.

The examiner's rejections are primarily based on his assertions that Tomihisa discloses Appellant's three dimensional network of silica particles as claimed. The examiner's position is not supported by the disclosure of the reference and his arguments have been rebutted by Appellant's Declaration.

The examiner cited the disclosure in col. 6 as disclosing three dimensional networks of the inorganic fine particles. Contrary to the examiner's assertion, the disclosure of Tomihisa in col. 6, lines 14-17 is a description of the known three dimensional configuration of Si and O *atoms* (and M atom if present):

> [T]he inorganic oxide is defined as an oxygen-containing metallic compound in which a metal *element* mainly constitutes a three-dimensional network *through bonding with an oxygen atom.* (emphasis added).

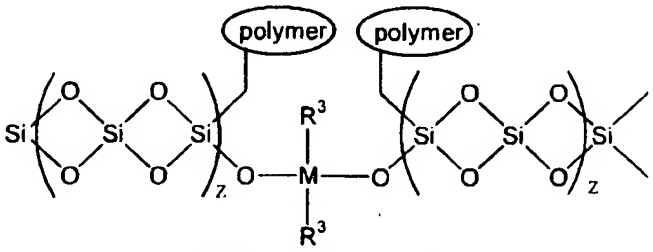
The three dimensional network is the configuration of the silicone (Si) atom bound to oxygen (O) atoms. When combined, the Si and O atoms are known to be in a tetrahedral configuration. Appellants submit that the above teaching is directed to the network of the Si and O atoms at the molecular level.

Tomihisa's reference to "three dimensional network" is limited to atoms. Tomihisa does not teach or suggest that the organic polymer is part of any three dimensional network. There is nothing in Tomihisa which teaches or suggests that a) the ionrganic fine *particles* or b) the organic polymer together with the inorganic fine *particles* form a three dimensional network relative to other inorganic fine particles.

The examiner did not provide any cogent technical reasoning to support his conclusion that the polymer "reads on" or functions as a bridge chain.

In the Declaration, Appellant provided a detailed review of the reactions used to produce the products of Tomihisa. Appellant presented detailed technical reasoning based

on Tomihisa's disclosure and examples of the hydrolysis/condensation reactions and concluded that the reactions result in compound fine particles having the following formula if component G is included:

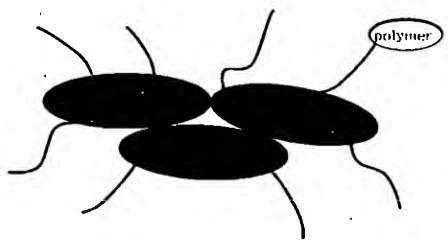


* at their case m=2 and n=4

M is the metal atom of component G. Appellants submit that the disclosure of "three dimensional networks" in Tomihisa refers to the known tetrahedral configuration of Si and O **atoms** (and M atoms if present) in the above formula. Appellant's claims recite three dimensional networks of silica **particles** formed by connecting the particles with bridge chains by the reactions recited in the claims.

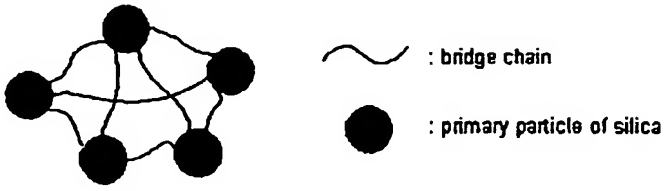
As explained in the Declaration, Tomihisa's hydrolysis/condensation reactions produce aggregates of silica fine particles connected by direct bonding of - Si - O - atoms or bonding through the M atom resulting in particles having an aggregated configuration as shown below:

The final product



aggregated silica fine particles with Si-O bonds

The aggregated product does *not* contain the openings produced by Appellant's claimed networks of silica particles and bridge chains as shown in Fig 1:



Although the polymer chains are bound to the surfaces of Tomihisa's aggregated particles, the polymer chains cannot connect the inorganic fine particles like Appellant's bridge chains because of the steric effects of the polymer chain. The chains from coupling agents and connecting materials recited in the claims recited in Appellant's claims form the three dimensional network of particles connected by bridge chains which prevent aggregation as shown in Fig. 1.

In the Final rejection, the examiner did not disputed Appellant's detailed technical reasoning and conclusion in the Declaration that Tomihisa's reactants and reactions result in aggregated inorganic fine particles. If the particles are aggregated, they cannot form three dimensional networks of silica particles connected by bridge chains. As shown above, Tomihisa's polymer chains are on the outer surfaces. Since the aggregated particles cannot form a three dimensional network of *particles* connected by bridge chains, Appellant's three dimensional network as claimed is not anticipated or rendered obvious by the aggregated product of Tomihisa.

Appellant's three dimensional network of silica particles connected by the bridge chains prevents aggregation of the silica particles (paragraph [0020] of the published application). The openings in Appellant's networked silica particles result from the bridge chains which connect the silica particles. The bridge chains are formed by the reactants and reactions set forth in the claims. The particles produced by the hydrolysis and condensation reaction of Tomihisa have an aggregated configuration. Tomihisa's aggregated silica

particles do not have openings "large enough to allow the intrusion of rubber molecules and to entangle rubber molecules with bridge chains" to produce increased tensile strength in the rubber (paragraph [0031] of the published application).

In the Final rejection, the examiner responded to Appellant's arguments by arguing that in "column 2 lines 14-15, column 6 lines 33-36 column 7 lines 7-12 where the inorganic fine particles are described. . . . the networks are described and seen to anticipate the network as claimed" (page 3, para. 6 of the Final rejection).

The cited disclosures do not support the examiner's arguments. In col 2, lines 12-15 are as follows:

> Showa 63-77940 discloses a method of obtaining a polymethylsesquioxane powder with particles having an almost truly spherical shape and a particle size distribution in a range of $\pm$30% of an average particle diameter

Appellant submits that the above disclosure referring to polymethylsesquioxane powder and their shape/particle distribution without any further details does not describe or suggest Applellant's three dimensional network of silica (SiO_2) particles connected by bridge chains and produced by the reactants and reactions recited in the claims. In col. 6, lines 33-36 are as follows:

> The shape of the inorganic fine particles including the above-mentioned inorganic matters may be any shape such as a sphere, needle, plate, scale, or crushed type and it is not especially limited

Appellant submits that the above general description of the shape of the inorganic fine particles per se is not a description of the configuration of the particles relative to each other. The above disclosure does not describe or suggest Applellant's three dimensional network of silica particles connected by bridge chains as claimed and shown in Fig 1. In col. 7, lines 7-12 are as follows:

> Although the compound fine particles made by binding an organic polymer to the surfaces of the inorganic fine particles, the binding does not mean simple

> adhesion and sticking together, but means that the organic polymer is not detected in a washing liquid obtained by washing the compound fine particle . . . .

The above disclosure that the polymer is bonded to the inorganic fine particles is not a teaching of a three dimensional network of silca particles. In the Declaration, Appellant explained that Tomihisa's sequence of hydrolysis/condensation reactions convert the polysiloxane groups which are already on the polymerizable monomer or polymer into inorganic fine particles having polymer chains bound to their surfaces.

In the Declaration, Appellant used the examples in Tomihisa and presented detailed technical reasoning to support his conclusion that the reactants and sequence of reactions produce aggregation of the inorganic particles as shown above. Although the polymer chains are bound to the surfaces of the aggregated particles, the polymer chains cannot connect the inorganic fine particles like Appellant's bridge chains because of the steric effects of the polymer chain. The chains from coupling agents and connecting materials recited in the claims in reactions also recited in Appellant's claims form the three dimensional network of particles connected by bridge chains which prevent aggregation as shown in Fig. 1.

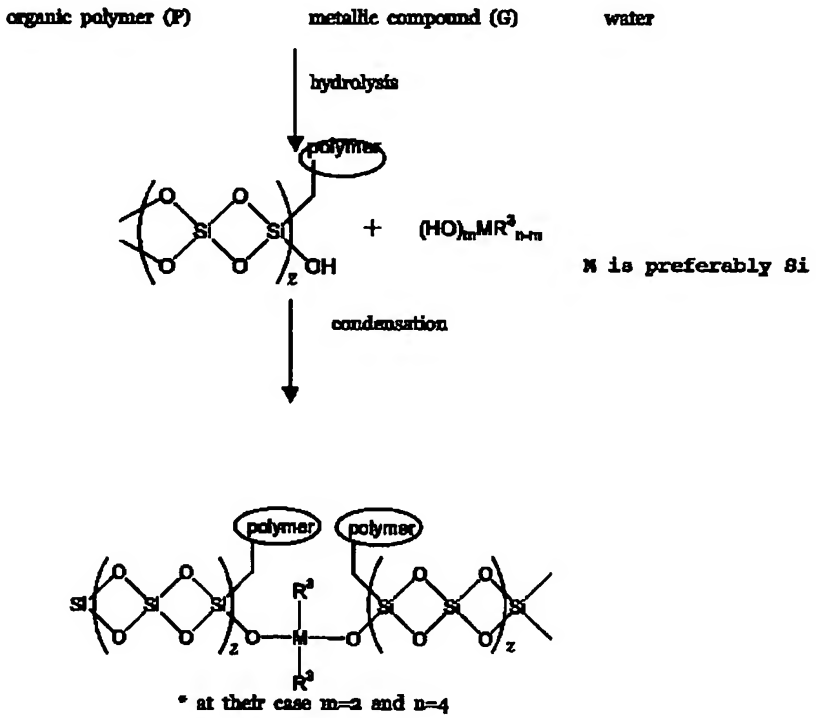
The polymer chains in the compound fine particles of Tomihisa do not "read on , and anticipate the 'bridge chains' as claimed"

The examiner's rejections are also based on his contention that Tomihisa's polymer chains "anticipate" Appellant's bridge chains because the polymer chains "have the same functional groups as claimed and be reacted with compounds having functional groups" (page 3, paragraph 7 of Final rejection citing col. 8, lines 54+ and col. 11, line 1+).

The sections of Tomihisa cited by the examiner do not support the examiner's contention. The disclosure in col.8, lines 54+ extends to col. 9 wherein it is disclosed that the R groups are on the polysiloxane group, not the polymer chain. The hydrogen, alkyl and acyl groups disclosed as R groups are *not* functional groups which could react with other R groups as occurs in reaction 1) of Appellant's claims. Moreover, the R functional groups are

hydrolyzed by hydrolysis prior to condensation with the hydrolyzed polysiloxane groups (see below from page 5 of Appellant's Declaration). Therefore, the polymer chains do not "have the functional groups as claimed" in Appellant's claims when the condensation reaction occurs with or without component G (the compounds disclosed in col. 11, lines 1+).

Contrary to the examiner's contention, the compounds for component G (disclosed in col. 11) are not reacted with the polymer chain. As shown on page 5 of Appellant's Declaration, the functional groups of component G are hydrolyzed and then the hydrolyzed product is reacted with the hydrolyzed polysiloxane groups, not the polymer chain:



Like the R groups, the functional groups of component G are hydrolyzed prior to condensation and then the hydrolyzed product condenses with the hydrolyzed polysiloxane groups, not the polymer chain. As a result, the inorganic fine particles are aggregated as shown above so the polymer chains cannot form the three dimensional network of particles according to Appellant's claims. Since the polymer chains do not connect the aggregated

silica particles and cannot form a three dimensional network, the polymer chains are not "readable on" and do not anticipate Appellant's bridge chains as claimed.

As explained in Appellant's Declaration, the presence of the polymer chains would be expected to prevent formation of Appellant's claimed three dimensional network of silica particles because of the steric effects of the polymer chains. The length of the polymer chains would preclude formation of a three dimensional network of silica particles. Instead, the particles are aggregated as a result of the condensation reaction between hydrolyzed polysiloxane groups and the polymer chains are attached to the outside surfaces of the aggregated particles as shown above.

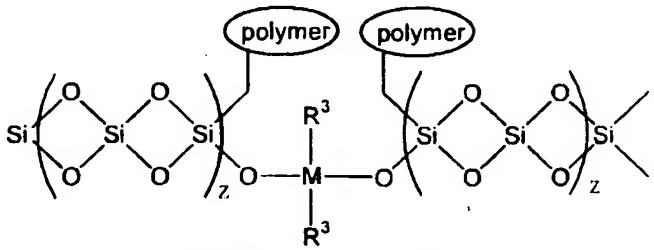
Furthermore, the polymer chains in Tomihisa would be expected to prevent formation of a three dimensional network of the inorganic fine particles because of steric effects of the long chains attached to the surfaces of the inorganic fine particles. As stated in Appellant's Declaration, the polymer chains would be expected to have a masking effect on the inorganic fine particles which would prevent the formation of three dimensional networks of either the inorganic fine particles or the compound fine particles (page 2, para. 1 and 2 of the Declaration).

The products of Tomihisa do not have connecting chains comprising carbon and hydrogen between the inorganic fine particles so as to form a three dimensional network

Another of the examiner's primary rationales for the rejections is that Tomihisa teaches chains comprising carbon and hydrogen between the inorganic fine particles so as to form a three dimensional network (page 4, para. 9 of Final rejection). The examiner argues that "Tomihisa teaches chains comprising carbon and hydrogen between the inorganic fine particles so as to form a three dimensional network, see column 8 lines 54+".

The examiner's characterization of the teaching in column 8 is erroneous. The disclosure in col. 8 discloses structure of the organic polymer with polysiloxane groups. The polysiloxane groups must undergo hydrolysis and condensation reactions to form the compound fine particles (col. 9, lines 12-15).

Appellant reviewed the disclosure of Tomhisa in detail and, as one skilled in the art, explained on page 5 of the Declaration that the condensation reaction results in aggregated silica fine products having polymer chains bound to their surfaces:



M is a metal atom and is present only if component G (which is optional) is included in the reactions.

Appellant's claims recite that the connecting chain which connects the silica particles is comprised of carbon and hydrogen. For example,if silica functionalized with 3-aminopropyl triethoxy silane is reacted with silica functionalized with 3-glycidoxypropyl trimethoxy silane, the connecting chain includes carbon and hydrogen atoms as shown below:

- O - Si - C3H6 - NH - CH2 - CH(OH) - CH2 - O - C3H6 - Si - O -

The fine particles produced by Tomihisa's hydrolysis/condensation reactions are directly connected by direct bonding of -Si-O- atoms or bonding through M atoms if component G is used. Tomihisa's particles are not connected by chains comprising carbon and hydrogen. The direct bonding or bonding through the metal atom causes the aggregation of the particles of Tomihisa.

The examiner's rejections are erroneous because the examiner has failed to rebut Appellant's technical reasoning and conclusions in the Declaration with adequate reasoning to support his rejections

The examiner does not dispute any specific aspect of Appellant's technical reasoning in the Declaration. After stating in the Final rejection that he had considered the Declaration, the examiner concluded that the Declaration "was not germane to the patentability" without any technical reasoning whatsoever. The examiner merely repeated his erroneous characterization of the teachings of the reference. As discussed previously, MPEP 2145 provides that "Office personnel should specifically set forth the facts and reasoning that justify this conclusion". MPEP 716.01 (B) provides that "[G]eneral statements such as "the declaration lacks technical validity" or "the evidence is not commensurate with the scope of the claims" without an explanation supporting such findings are insufficient". MPEP 716.01(d) provides that:

> Facts established by rebuttal evidence must be evaluated along with the facts on which the conclusion of a prima facie case was reached, not against the conclusion itself. *In re Eli Lilly*, 902 F.2d 943, 14 USPQ2d 1741 (Fed. Cir. 1990).

Appellant's claims recite reaction of silica particles or functionalized silica particles whereas Tomishia does not disclose silica or silica reacted with coupling agents

In the Office action dated March 18, 2010, the examiner argued that Tomihisa teaches reaction of coupling agents "onto the silica as claimed". In the Amendment filed June 18, 2010 , Appellant rebutted the examiner's arguments by showing that Tomihisa does not disclose the use of silica particles per se as a starting material and that Tomihisa teaches away from using silica particles in the comparative examples.

In the Final rejection, the examiner took the position that Appellant's "claims are not drafted so as to limit the silica to be a starting material distinguished from the silica of the prior art" (page 3, lines 1-2). As discussed previously, Tomihisa teaches that the starting materials are polymers or polymerizable monomers containing at least one polysiloxane group. A polysiloxane group is not a silica particle. In the reactions recited in Appellant's claims, silica particles are used as starting materials in reaction 2). In reactions 1) and 3), silica particles functionalized with alkoxy silane coupling agents are used as starting

materials. The functionalized silica particles are made using silica particles as starting materials so all of the reactions set forth in Appellant's claims directly or inherently use silica particles as starting materials.

There is nothing in Tomihisa that teaches or suggests the use of silica particles or functionalized silica particles to produce the desired compound fine particles. In the Office action of March 18, 2010, the examiner also asserted that "[T]hese three dimensional networks are formed from reacting the silica with coupling agents having functional groups, See column 10 lines 10+".

The cited disclosure does not support the examiner's assertion. In col. 10, lines 10+, Tomihisa teaches that 1) the compound fine particles include inorganic fine particles and an organic polymer, the organic polymer being bound to the surfaces of the inorganic fine particles and 2) that the compound fine particles are produced from hydrolysis and condensation of *polysiloxane* groups which are already bound to a polymer or polymerizable monomer (see also col. 6, lines 4-9 and col. 4, lines 24-34). Polysiloxane groups are not silica particles so these descriptions do not constitute teachings of using silica as a reactant. As disclosed in Tomihisa and explained in the Declaration, the fine particles described by Tomihisa are obtained by 1) hydrolysis of polysiloxane groups which are attached to polymers or polymerizable monomers and then 2) condensation of the hydrolyzed polysiloxane groups to form aggregated inorganic fine particles having polymer chains attached to their surfaces.

Numerous alkoxy silane coupling agents are disclosed by Tomihisa. However, these disclosures are not sufficient because Tomihisa does not teach the reaction of silica particles per se or functionalized silica particles with the disclosed coupling agents or other compounds to form the products desired by the reference. These disclosures are not sufficient because, as explained in Appellant's Declaration, Tomihisa's disclosed hydrolysis/condensation reactions result in aggregated particles which cannot form Appellant's three dimensional network of particles as claimed.

On the contrary, Tomihisa specifically teaches that the use of colloidal silica (dispersion of silica particles in liquid phase) or colloidal silca with a silane coupling agent does not produce the desired products. In the comparative examples in col. 39-42, colloidal silica and colloidal silica with a silane coupling agent were used in reactions which are different from reactions 1), 2), and 3) of Appellant's claims. The products of the comparative examples are not the same as the claimed products because the reactants and reactions in the comparative examples are different from reactions 1), 2), and 3) of Appellant's claims. It is also noted that the comparative examples do not disclose at least two functionalized silica particles as required by claimed reaction 1). The comparative examples do not disclose the organic connecting material containing two functional groups (elected group is dihalide) which are recited in claimed reaction 2) and reaction 3) in which the connecting material is reacted with the silica particles or functionalized silica particles to form the organic bridge chain.

In the comparative examples, Tomihisa specifically discloses that "no alkoxy group was found on the particles" and that the polymer coupling agent or polymer does not bond with the colloidal silica. Appellant's network is different from the products of the comparative examples because Appellant's silica particles are chemically bonded to bridge chains by the reactions recited in the claims. In Tomihisa's desired products, the inorganic fine particles are bound to polymers and containing alkoxy groups (col. 4, lines 11-13, lines 16-18). Therefore, the comparative examples show that the use of silica particles fails to produce the compound fine particles desired by the reference. One skilled in the art would not be motivated to use silica particles in the processes of Tomihisa because the comparative examples teach away from the use of silica particles as reactants.

Rejection under 35 U.S.C. 103 as obvious over U.S. Patent No. 5,683,501 (Tomihisa)

The previous discussion of the anticipation rejection is herein incorporated by reference. The examiner's alternative rejection under 35 USC 103 is based on the contention that Tomihisa "discloses all of the limitations of a claim except a property or function, and the

examiner cannot determine whether or not the reference inherently possess properties or function which . . . render obvious the claimed invention". Apparently recognizing the differences between the processes of Tomihisa and those recited in Appellant's claims, the examiner has taken the position that Tomihisa "teaches a product that appears to be . . . an obvious variant, of the product set forth in a product-by-process claim although produced by a different process" .

In paragraph 3 of the Final rejection, the examiner specifically states that "Claims 33, 36 - 41, 43 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomihisa et al. US5,683,501". The examiner did not present any rationale for the obviousness rejection other than the erroneous characterizations of Tomihisa's disclosure and citing case law to support his position that Tomihisa's product is the same as or an obvious variant of Appellant's product.

In paragraph 10 of the Final rejection, the examiner made the following statement:

> Applicant's obviousness analysis following Graham v. John Deere . . . is not relevant to the rejection set forth herein. The rejection under 35 USC 102/103 set forth herein is essentially, an anticipation rejection.

Appellant submits that the obviousness analysis is mandatory whenever an obviousness rejection is made by the examiner regardless of whether there is also a rejection under 35 USC 102. Therefore, the examiner erred by not applying the Graham analysis to support his express rejection under 35 USC 103 in paragraph 3 of the Final rejection. The examiner has not established a prima facie of obviousness because the examiner's rationales were limited to anticipation and he admits that he did not perform the Graham analysis to support his express rejection under 35 USC 103.

The examiner did not present any rationale for his position that Appellant's claimed product is "an obvious variant" of the products of Tomihisa or rebut Appellant's arguments against the obviousness rejections. The Supreme Court quoting *In re Kahn,* 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006), stated that "'[R]ejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some

articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.'" *KSR*, 550 U.S. at ___, 82 USPQ2d at 1396.

Appellant's claims specifically recite silica particles or functionalized silica particles as reactants. The examiner does not dispute that silica (SiO_2) per se is not disclosed in the lengthy list of reactants in Tomihisa. The examiner does not dispute that Tomihisa does not disclose the use of silica particles functionalized with alkoxy silane coupling agents.

In paragraph 11 of the Final rejection, the examiner cites case law relating to the "anticipation or obviousness of species by disclosure of a genus". Appellant submits that the disclosure of a genus in Tomihisa does not inherently disclose all species within that genus. *Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings*, 370 F.3d 1354, 1367, 71 USPQ2d 1081, 1091 (Fed. Cir. 2004) (explaining that "[a] prior art reference that discloses a genus still does not inherently disclose all species within that broad category" but must be examined to see if a disclosure of the claimed species has been made or whether the prior art reference merely invites further experimentation to find the species).

Furthermore, the examiner does not provide any explanation or rationale as to how the case law applies to either rejection. All of the reactants in Appellant's claims are known materials. The disclosure of species such as Appellant's alkoxy coupling agents or connecting materials is not sufficient to support either an anticipation or obviousness rejection because the examiner failed to a) identify any disclosure which specifically disclosed a product within the scope of Appellant's claims and b) provide any rationale or motivation for the selection of Appellant's silane coupling agents or organic connecting materials from Tomihisa's lengthy list of organic and inorganic reactants for component G and c) provide any rationale to support a conclusion that the use of the coupling agents and/or connecting materials in Tomihisa's processes would result in Appellant's claimed networks.

As explained previously, contrary to the examiner's contention, the compounds for component G (disclosed in col. 11) are not reacted with the polymer chain. As shown on page 5 of Appellant's Declaration, the functional groups of component G are hydrolyzed and

then the hydrolyzed product is reacted with the hydrolyzed polysiloxane groups, not the polymer chain. Since the functional groups of both the polysiloxane groups and component G are hydrolyzed prior to condensation, the resulting particles are aggregated.

Even if the R groups or component G contains the functional groups recited in Appellant's claims, the functional groups on the polysiloxane group and component G are hydrolyzed in the hydrolysis step. The functional groups are no longer present in the condensation reaction in which the hydrolyzed products are condensed. Therefore, even if the alkoxy silane coupling agents recited in Appellant's reactions 1) and 3) and/or the connecting material of reaction 2) were selected from Tomihisa's lengthy lists of reactants, the functional groups would be hydrolyzed so the groups could not react with each other or any connecting material in the manner required by Appellant's claims. As a result, the bridge chains according to Appellant's claims would not be formed. Instead, the aggregated product is formed as explained by Appellant's Declaration.

The examiner did not rebut Appellant's technical reasoning or Appellant's conclusion in the Declaration

The examiner did not rebut Appellant's technical reasoning or conclusions in the Declaration that the use of the reactants in Tomihisa's specified reactions result in aggregated particles. Appellant submits that one skilled in the art would consider the aggregated product different and distinct from the networks of particles formed by bridge chains as claimed in Appellant's claims.

Appellant's submit that the disclosure of Tomihisa does not support the examiner's position that the products of the reference appear to be obvious variants of Appellant's claimed products. The previous discussion of the rejection of under 35 USC 102 is herein incorporated by reference. For the reasons discusses therein, the reference does not support the examiner's contentions that 1) Tomihisa teaches "three dimensional networks of inorganic fine particles", 2) Tomihisa teaches polymer chains which "read on and anticipate the 'bridge chains' as claimed" because the polymer chains "have the same functional groups as claimed and be reacted with compounds having functional groups" and 3)

Tomihisa teaches chains comprising carbon and hydrogen between the inorganic fine particles so as to form a three dimensional network.

In response to the obviousness rejections, Appellant also cited Tomihisa's comparative examples which teach away from using silica particles as reactants. In the Final rejection, none of the sections of the reference cited by the examiner disclose the use of silica particles as reactants. The comparative examples disclose colloidal silica is not suitable and the examiner did not dispute that these examples teach away from the use of the particle reactants set forth in Appellant's claims. Furthermore, the examiner erroneously argued that the claims are not limited to the use of silica particles as starting materials. As discussed in detail hereafter, all of the claims recite the use of silica particles or silica particles which have been reacted with alkoxy silane coupling agents.

Tomihisa's comparative examples teach away from the use of silica or functionalized silica as a reactant; teaching away is evidence of non-obviousness of Appellant's claimed invention

A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).

In the reactions recited in Appellant's claims, silica particles are used as starting materials in reaction 2). In reactions 1) and 3), silica particles functionalized with alkoxy silane coupling agents are used as starting materials. The functionalized silica particles are made using silica particles as starting materials (paragraph [0033] of the published application) so all of the reactions set forth in Appellant's claims inherently use silica particles as starting materials.

Tomihisa's comparative examples teach away from the use of silica or functionalized silica as a reactant. In the comparative examples in col. 39-42, colloidal silica (dispersion of siica particles in liquid phase) and colloidal silica with a silane coupling agent were used.

The comparative examples show that the desired products are not obtained by the direct use of either colloidal silica or colloidal silica with a coupling agent.

In the comparative examples, Tomihisa specifically discloses that "no alkoxy group was found on the particles" and that the polymer coupling agent or polymer does not bond with the colloidal silica. Therefore, the particles are not connected as required by Appellant's claims. Tomihisa's compound fine particles are disclosed as including inorganic fine particles bound to polymers and containing alkoxy groups (col. 4, lines 11-13, lines 16-18). Therefore, the comparative examples teach away from the use of silica particles or functionalized silica particles to obtain the compound fine particles desired by the reference.

The examiner did not dispute that the comparative examples teach away from the use of silica particles or silica particles with coupling agents as reactants

In the Final rejection, the examiner did not dispute that the comparative examples teach away from the use of silica particles or silica particles with coupling agents as reactants.The examiner did not dispute that the examples show that colloidal silica does not react with the polymer. The examiner's rejections under 35 USC 103 must be reversed because he has failed to rebut or even address the evidence of nonobviousness in Appellant's Declaration and Tomihisa's comparative examples.

With regard to the examiner's argument that silica particles are not set forth in Appellant's claims, it is noted that all three of the reactions set forth in Appellant's claims recite silica particles or functionalized silica particles as a reactant. Functionalized silica particles are derived from silica particles (paragraph [0025] of the published application). Tomihisa does not teach the use of silica particles to produce the desired products and instead teaches away from silica particles in the comparative examples because they do not react with the polymers as required by Tomihisa.

Tomihisa does not provide a sufficient basis for a reasonable expectation of success

Reasonable expectation of success is the standard with which obviousness is determined. Applicant submits that there is no reasonable expectation of success in obtaining Applicant's claimed three dimensional network from the reactants and/or the processes disclosed by Tomihisa or any modification of the process of Tomihisa. The examiner did not present any technical rationale to rebut Appellant's conclusion in the Declaration that the inorganic fine particles in Tomihisa are in an aggregated configuration. The examiner merely repeated his erroneous characterization of Tomihisa's "three dimensional networks" in col. 6 despite the fact that the disclosure refers to atoms whereas Appellant's claims recite a network of silica *particles* connected by bridge chains.

Appellants submit that there is nothing in Tomihisa that supports a conclusion that an aggregated configuration is "an obvious variant" of Appellant's claimed three dimensional network of silica particles connected by bridge chains as shown in Fig. 1. Contrary to the examiner's arguments, Appellant submits that Tomihisa's polymers do not have the functional groups set forth in Appellant's claims. The reference requires an organic polymer or polymerizable monomer having SiOR groups as the starting material. The R groups are on the polysiloxane groups, not the polymer chain. An optional reactant, component G is disclosed. The use of silica particles per se or silica particles functionalized with alkoxy silane coupling agents as in Appellant's claims is not disclosed.

Even if the R groups or component G contains the functional groups recited in Appellant's claims, there is no reasonable expectation of success in obtaining Appellant's claimed networks because the functional groups on the polysiloxane group and component G are hydrolyzed in the hydrolysis step. The functional groups are no longer present in the condensation reaction in which the hydrolyzed products are condensed. Therefore, even if the alkoxy silane coupling agents recited in Appellant's reactions 1) and 3) or the connecting material of reaction 2) were selected from Tomihisa's lengthy lists of reactants, the functional groups would be hydrolyzed so the groups could not react with each other or any connecting material as required by Appellant's claims. As a result, the bridge chains

according to Appellant's claims would not be formed. Instead, the aggregated product is formed as explained by Appellant's Declaration.

For the reason discussed previously, the polymer chains in Tomihisa would be expected to prevent the formation of Appliant's three dimensional network of silica particles. Therefore, there is no reasonable expectation of success that Appellant's three dimensional networks would be formed with the polymer chains.

There is no reasonable expectation of success in using silica particles per se or functionalized silica particles as starting material in the process of Tomihisa because the reference teaches away from the use of silica particles or silica particles with coupling agents as starting materials in the Comparative examples. The reference specifically teaches that the polymer does not bond with the colloidal silica and that the resulting products are unsuitable for their intended use. Applicant's submit that such is evidence of no reasonable expectation of success and that teaching away is evidence of non-obviousness of Applicant's claimed invention.

Group II: Claim 36, 37, and 39

Claim 36 is directed to a three-dimensional network of silica particles wherein the silica particles are connected by bridge chains wherein the connecting chain is comprised of carbon and hydrogen and wherein the network of silica particles is produced by the following reaction:

Reaction 1)
reacting a1) silica particles functionalized with alkoxy silane coupling agents having functional groups with b) silica particles functionalized with alkoxy silane coupling agents having different functional groups so that the functional groups of a1) and b) are covalently bonded

wherein the functional groups of a1) are amine or imine groups and the functional groups of b) are mercapto groups.

Claim 37 is directed to the above described network of silica particles wherein the functional groups of a1) are amine or imine groups and the functional groups of b) are glycidyl groups.

Claim 39 is directed to the above described network of silica particles wherein the functional groups of a1) are amine groups and the functional groups of b) are halide groups.

Appellant elected the amine species for the functional group.

Rejection under 35 U.S.C. 102 (b) as anticipated by U.S. Patent No. 5,683,501 (Tomihisa)

The previous discussion of the rejection of claim 33 under 35 USC 102 is herein incorporated by reference. For the reasons discussed therein, Appellant's submit that the disclosure of Tomihisa does not support the examiner's position that the products of the reference appear to be the same as Appellant's claimed products in claims 36, 37, and 39.

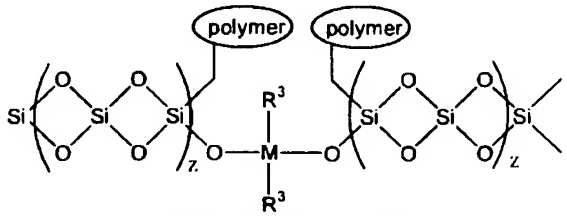
Dependent claims 36, 37, and 39 are limited to reaction 1) recited in independent claim 33 and recite Appellant's elected amine or imine group as functional groups. As discussed previously, Tomihisa does not specifically disclose any compound fine particles made from silica particles functionalized with alkoxy silane coupling agents as set forth in the above claims. In the above claims, silica particles functionalized with alkoxy silane coupling agents are used as starting materials. Moreover, the functionalized silica particles are made using silica particles as starting materials so the reaction set forth in the above claims inherently use silica particles as a starting material.

Although alkoxy silane coupling agents having the above functional groups may be disclosed in the lengthy lists of components G and H in Tomihisa, there is nothing in Tomihisa which teaches or suggests the use of an alkoxy silane coupling agent having functional groups together with another coupling agent having a functional group which reacts with the group of the other agent.

Appellant submits that a lengthy list of alkoxy silane coupling agents, some with amine groups and coupling agents containing a group reactive with the amine group is not sufficient to support anticipation of a product which is made by reacting functionalized silica

particles having functional groups which are reactive with each other as recited in the above claims. As discussed in connection with claim 33, the functional groups on component G and the groups on the polysiloxane groups are hydrolyzed to form OH groups which are condensed to form the aggregated inorganic fine particles. Therefore, even if more than one component G or H were used in the process of Tomihisa, they would not react with each other's functional groups because these groups would be hydrolyzed for condensation with the hydrolyzed polysiloxane group. The resulting product would be aggregated because the particles would be bonded through the Si atom of the coupling agent as shown previously.

None of the products specifically disclosed in Tomihisa's examples disclose a product which appears to be the same as Appellant's claimed product. The processes of Tomihisa include the first step of making the organic polymer containing polysiloxane groups which must be subjected to hydrolysis and condensation to produce the compound fine particles. The examples beginning in col. 28 of Tomihisa designated by "Z" disclose several processes and reactants. None of the examples disclose or suggest the use of the reactants set forth in claims 36, 37, or 39. As explained on page 5 of the Declaration, Tomihisa's condensation reaction results in aggregated silica fine products having polymer chains bound to their surfaces:



* at their case m=2 and n=4

M is the metal atom of component G. The products of claims 36, 37, and 39 are not aggregated because of the network formed by connecting the silica particles with the alkoxy silane coupling agents as recited in these claims.

As discussed previously for claim 33, the polymers are not "readable on" Appellant's bridge chains. Claims 36, 37, and 39 use silica particles functionalized with alkoxy silane coupling agents and the bridge chains are formed by reaction of the functional groups on the coupling agents. The bridge chains formed by the functional groups on the alkoxy

coupling agents are *not* polymeric. The bridge chains are monomeric chains whose length is determined by the alkyl group connected to the Si atom. Therefore, Tomihisa's polymers are not "readable on" Appellant's bridge chains resulting from the reaction set forth in claims 36, 37, or 39.

The reaction recited in the above claims results in carbon and hydrogen atoms in the chains connecting the silica particles. Appellant's claims recite that the connecting chain which connects the silica particles is comprised of carbon and hydrogen. Claims 36, 37, and 39 recite reaction 1). For example, if silica functionalized with 3-aminopropyl triethoxy silane is reacted with silica functionalized with 3-glycidoxypropyl trimethoxy silane, the connecting chain includes carbon and hydrogen atoms as shown below:

$$\text{Silica - O - Si - } C_3H_6 \text{ - NH - } CH_2 \text{ - CH(OH) - } CH_2 \text{ - O - } C_3H_6 \text{ - Si - O -Silica}$$

The alkoxy silane coupling agents contain alkyl groups which become part of the connecting chain between the silica particles as a result of reaction 1) (paragraph [0027] of the published application).

As shown above, the fine particles produced by Tomihisa's hydrolysis/condensation reactions are directly connected by bonding through metal atom, M, by O - M - O - atoms if component G is used. Tomihisa's particles are not connected by chains comprising carbon and hydrogen. The direct bonding or bonding through the metal atom causes the aggregation of the particles of Tomihisa.

Rejection under 35 U.S.C. 103 as obvious over U.S. Patent No. 5,683,501 (Tomihisa)

The previous discussion of the rejection of claim 33 under 35 USC 103 is herein incorporated by reference. For the reasons discussed therein, Appellant's submit that the disclosure of Tomihisa does not support the examiner's position that the products of the reference appear to be obvious variants of Appellant's claimed products.

Although the coupling agents having the recited functional groups may be disclosed in the lengthy lists of components G and H in Tomihisa, there is nothing in Tomihisa which would motivate one skilled in the art to select at least two alkoxy silane coupling agents

having functional groups on one agent which reacts with the functional group of the other agent in the process of producing the inorganic fine particles.

Even if two alkoxy silane coupling agents were used in the process of Tomihisa, the functional groups would be hydrolyzed as shown on page 5 of Appellant's Declaration. Once the functional groups are hydrolyzed, they would no longer be capable of reacting with each other to form the bridge chains of claims 36, 37, and 39.

As discussed previously for claim 33, the polymers are not "readable on" Appellant's bridge chains. Claims 36, 37, and 39 use silica particles functionalized with alkoxy silane coupling agents and the bridge chains are formed by reaction of the functional groups on the coupling agents. The bridge chains formed by the reaction of the functional groups on the alkoxy coupling agents are *not* polymeric. The bridge chains are monomeric chains whose length is determined by the alkyl group connected to the Si atom. Therefore, Tomihisa's polymers are not "readable on" Appellant's bridge chains resulting from the functionalized silica particles set forth in claims 36, 37, or 39.

Tomihisa's comparative examples teach away from the use of silica or functionalized silica as a reactant in the processes disclosed by the reference; teaching away is evidence of non-obviousness of Appellant's claimed invention

The arguments relating to Tomihisa's comparative examples which were presented against the obviousness rejection of claim 33 are herein incorporated by reference.

Tomihisa specifically teaches that the use of colloidal silica or colloidal silica with a silane coupling agent does not produce the desired products. In the comparative examples in col. 39-41, colloidal silica was treated with a silane coupling agent and used in reactions which are different from reaction 1) of Appellant's claims. Only one silane coupling agent is used. The products of the comparative examples are not the same as the claimed products because only one silane coupling agent is used so the reactants and reactions in the comparative examples are different from reaction 1) of Appellant's claims. Tomihisa specifically teaches that the polymer does not react with the silica particles and no alkoxy group was found on the particles. The comparative examples are evidence of non-

obviousness of the above claims since Tomihisa teaches that the desired products are not obtained.

Appellant submits that Tomihisa's teaching away is evidence of non-obviousness of Appellant's claimed invention which has not been addressed or rebutted by the examiner. As noted previously, Appellant's claims recite silica particles per se or functionalized silica particles. The functionalized particles are derived from silica particles so all of Appellant's reactions use silica particles as starting materials.

Tomihisa does not provide a sufficient basis for a reasonable expectation of success

The arguments presented against the obviousness rejection of claim 33 in connection with reasonable expectation of success are herein incorporated by reference.

Even if two alkoxy silane coupling agents were selected from the lengthy list of Tomihisa, there is no reasonable expectation of success that Appellant's bridge chains would be formed. As discussed, the functional groups would be hydrolyzed as shown on page 5 of Appellant's Declaration. Once the functional groups are hydrolyzed, they would not react with each other to form the bridge chains of claims 36, 37, and 39. Instead, the aggregated product would be formed as explained in Appellant's Declaration.

There is no reasonable expectation of success in using silica particles per se or functionalized silica particles as starting material in the process of Tomihisa because the reference teaches away from the use of silica particles and silica particles with coupling agents as starting materials in the Comparative examples. The reference specifically teaches that the polymer does not bond with the colloidal silica and that the resulting products are unsuitable for their intended use.

Applicant's submit that Tomihisa's disclosure in the comparative examples is evidence of no reasonable expectation of success and that the examples' teaching away is evidence of non-obviousness of Applicant's claimed invention.

Group III: Claims 38 and 40

Claim 38 is directed to a three-dimensional network of silica particles wherein the silica particles are connected by bridge chains wherein the connecting chain is comprised of carbon and hydrogen and wherein the network of silica particles is produced by the following reaction:

Reaction 1)
reacting a1) silica particles functionalized with alkoxy silane coupling agents having functional groups with b) silica particles functionalized with alkoxy silane coupling agents having different functional groups so that the functional groups of a1) and b) are covalently bonded

wherein the coupling agent of a1) is 3-aminopropyltriethoxy silane and the coupling agent of b) is 3-glycidyloxypropyltrimethoxy silane.

Claim 40 is directed to the above described network of silica particles wherein the coupling agent of a1) is 3-aminopropyltriethoxy silane and the coupling agent of b) is 3-chloropropyltrimethoxy.

Rejection under 35 U.S.C. 102 (b) as anticipated by U.S. Patent No. 5,683,501 (Tomihisa)

The previous discussions of the rejection of claims 33, 36 37, and 39 under 35 USC 102 are herein incorporated by reference. For the reasons discusses therein, Appellant's submit that the disclosure of Tomihisa does not support the examiner's position that the products of the reference appear to be the same as Appellant's claimed products in claims 38 and 40. Dependent claims 38 and 40 are limited to reaction 1) recited in independent claim 33 using the coupling agents for a1) and b) specified in the claims.

Appellant reviewed the disclosure of Tomihisa in detail and, as one skilled in the art, explained on page 5 of the Declaration that the condensation reaction results in aggregated silica fine products having polymer chains bound to their surfaces.

The fine particles produced by Tomihisa's hydrolysis/condensation reactions are directly connected by direct bonding of -Si-O- atoms or bonding through M atoms if component G is used. Therefore, Tomihisa's particles are not connected by chains comprising carbon and hydrogen. The direct bonding or bonding through the metal atom causes the aggregation of the particles of Tomihisa. The bridge chains formed by the reaction of the functional groups of the reactants recited in Appellant's claims prevent aggregation of the particles by forming a three dimensional network of the silica particles as shown in Fig. 1.

Appellant's claims recite that the connecting chain which connects the silica particles is comprised of carbon and hydrogen. In claims 38, silica functionalized with 3-aminopropyl triethoxy silane is reacted with silica functionalized with 3-glycidoxypropyl trimethoxy silane, the connecting chain includes carbon and hydrogen atoms as shown below:

- O - Si - C3H6 - NH - CH2 - CH(OH) - CH2 - O - C3H6 - Si - O -

The connecting chain resulting from the reactants set forth in claim 40 would likewise include carbon and hydrogen atoms because of the reaction of the functional groups of the coupling agents with each other.

As discussed previously for claims 33, 38, 37, and 39, the polymers are not "readable on" Appellant's bridge chains. Claims 38 and 40 use silica particles functionalized with the alkoxy silane coupling agents recited in the claims and the bridge chains are formed by reaction of the functional groups on the coupling agents. As shown above, the bridge chains formed by the functional groups on the alkoxy coupling agents are *not* polymeric. The bridge chains are monomeric chains whose length is determined by the propyl amine and propyl ether chain connecting the silica particles. Therefore, Tomihisa's polymers are not "readable on" Appellant's bridge chains resulting from the reaction set forth in claims 38 and 40.

Rejection under 35 U.S.C. 103 as obvious over U.S. Patent No. 5,683,501 (Tomihisa)

The previous discussions of the rejection of claims 33, 36, 37, and 39 under 35 USC 103 are herein incorporated by reference. For the reasons discussed therein, Appellant's submit that the disclosure of Tomihisa does not support the examiner's position that the products of the reference appear to be obvious variants of Appellant's claimed products of claims 38 and 40.

Although the coupling agents having the recited functional groups may be disclosed in the lengthy lists of components G and H in Tomihisa, there is nothing in Tomihisa which would motivate one skilled in the art to select at least two alkoxy silane coupling agents having functional groups on one agent which reacts with the functional group of the other agent in the process of producing the inorganic fine particles.

Even if two alkoxy silane coupling agents were used in the process of Tomihisa, the functional groups would be hydrolyzed as shown on page 5 of Appellant's Declaration. Once the functional groups are hydrolyzed, they would no longer be capable of reacting with each other to form the bridge chains of claims 36, 37, and 39. Instead, they would form the aggregated product as explained in Appellant's Declaration.

As discussed previously for claim 33, the polymers are not "readable on" Appellant's bridge chains. Claims 36, 37, and 39 use silica particles functionalized with the specified alkoxy silane coupling agents and the bridge chains are formed by reaction of the functional groups on the coupling agents. As shown above, the bridge chains formed by the reaction of the functional groups on the alkoxy coupling agents are *not* polymeric. The bridge chains are monomeric chains whose length is determined by the propyl groups connected to the Si atom. Therefore, Tomihisa's polymers are not "readable on" Appellant's bridge chains resulting from the reactants and reaction set forth in claims 38 and 40.

Tomihisa's comparative examples teach away from the use of silica or functionalized silica as a reactant; teaching away is evidence of non-obviousness of Appellant's claimed invention

The arguments relating to Tomihisa's comparative examples which were presented against the obviousness rejection of claim 33, 36, 37, ad 39 are herein incorporated by reference.

Tomihisa specifically teaches that the use of colloidal silica or colloidal silica with a silane coupling agent does not produce the desired products. In the comparative examples in col. 39-41, colloidal silica was treated with a silane coupling agent and used in reactions which are different from reaction 1) of Appellant's claims. Comparative example 2, 4, and 5 disclose alkoxy silane coupling agents which are recited in claims 38 and 40 but used in different reactions. In these examples, only one silane coupling agent is used. The products of the comparative examples are not the same as the claimed products because only one silane coupling agent is used and reactions in the comparative examples are different from the product of claims 38 and 40. Tomihisa specifically teaches that the polymer does not react with the silica particles and no alkoxy group was found on the particles. The comparative examples are evidence of non-obviousness of the above claims since Tomihisa teaches that the desired products are not obtained.

Appellant submits that Tomihisa's teaching away is evidence of non-obviousness of Appellant's claimed invention which has not been addressed or rebutted by the examiner. As noted previously, Appellant's claims recite silica particles per se or functionalized silica particles. The functionalized particles are derived from silica particles so all of Appellant's reactions use silica particles as starting materials.

Tomihisa does not provide a sufficient basis for a reasonable expectation of success

The arguments presented against the obviousness rejections of claim 33, 36, 37, and 39 are herein incorporated by reference. Even if the alkoxy silane coupling agents of claims 38 and 40 were selected from the lengthy list of Tomihisa, the functional groups would be hydrolyzed as shown on page 5 of Appellant's Declaration. Once the functional groups are hydrolyzed, they would not react with each other to form the bridge chains of claims 38 and

40. Instead, they would form the aggregated silica particles shown in Appellant's Declaration.

Group IV: Claims 41 and 43

Claim 41 is directed to a three-dimensional network of silica particles wherein the silica particles are connected by bridge chains wherein the connecting chain is comprised of carbon and hydrogen and wherein the network of silica particles is produced by

Reaction 2)
reacting silica particles with an organic connecting material wherein the connecting material is diamine, diisocyanate or dihalide wherein the silica particles react with the diamine, dihalide, or diisocyanate groups of the connecting materials.

Claim 43 is directed to the above described network of silica particles wherein the silica particles react with the dichloride groups of the organic connecting material. Appellant elected the dihalide species for the organic connecting material.

Rejection under 35 U.S.C. 102 (b) as anticipated by U.S. Patent No. 5,683,501 (Tomihisa)

The previous discussions of the rejection of claims 33 and 36 - 40 under 35 USC 102 are herein incorporated by reference. For the reasons discusses therein, Appellant's submit that the disclosure of Tomihisa does not support the examiner's position that the products of the reference appear to be the same as Appellant's claimed products in claims 41 and 43.

As discussed previously, Tomihisa does not specifically disclose any compound fine particles made from silica particles as set forth in claims 41 and 43. In these claims, silica particles are used as starting materials. Although organic dihalide connecting materials may be disclosed in the lengthy lists of components G and H in Tomihisa, there is nothing in Tomihisa which teaches or suggests the use of reaction of silica particles and a dihalide organic connecting material in the processes disclosed by Tomihisa. Appellant submits that

a lengthy list which may include organic materials with two functional groups is not sufficient to support anticipation of a product which is made by reacting silica particles with the dihalide organic connecting materials as recited in claims 41 and 43.

None of the products specifically disclosed in Tomihisa's examples disclose a product which appears to be the same as Appellant's claimed product. The processes of Tomihisa include the first step of making the organic polymer containing polysiloxane groups which must be subjected to hydrolysis and condensation to produce the compound fine particles. The examples beginning in col. 28 of Tomihisa designated by "Z" disclose several processes and reactants. None of the examples disclose or suggest the use of the reactants set forth in claims 41 and 43. As explained on page 5 of the Declaration, Tomihisa's condensation reaction results in aggregated silica fine products having polymer chains bound to their surfaces. The products of claims 41 and 43 are not aggregated because of the network formed by connecting the silica particles with organic connecting material as recited in claims 41 and 43.

As discussed previously, the polymers are not "readable on" Appellant's bridge chains. Claims 41 and 43 use silica particles and a dihalide organic connecting material and the bridge chains are formed by reaction of silica particles and the organic connecting material. The bridge chains formed by the organic connecting material are *not* the same as the polymeric chains of Tomihisa which would be expected to prevent the formation of Appellant's three dimensional network. The bridge chains are chains whose functional groups react with the silica particles. Their length is determined by the alkyl group between the functional groups on the connecting material. Therefore, Tomihisa's polymers are not "readable on" Appellant's bridge chains resulting from the reaction set forth in claims 41 and 43.

The reaction recited in the claims 41 and 43 results in carbon and hydrogen atoms in the chain connecting the silica particles formed by the connecting material. The connecting materials contain carbon groups which become part of the connecting chain between the silica particles as a result of reaction 2) (paragraph [0029] of the published application).

As shown in Appellant's Declaration, the fine particles produced by Tomihisa's hydrolysis/condensation reactions are directly connected or, if component G is used, by bonding through M by O - M - O - atoms from component G. Tomihisa's particles are not connected by chains comprising carbon and hydrogen. The direct bonding or bonding through the metal atom causes the aggregation of the particles of Tomihisa. The bridge chains formed by the reaction of the silica particles and organic connecting materials recited in claims 41 and 43 connect the particles in a chain comprised of carbon and hydrogen. Aggregation of the particles is prevented by the three dimensional network of the silica particles formed by bridge chains from the organic connecting materials as shown in Fig. 1.

Claims 41 and 43 recite reaction of silica particles whereas Tomihisa does not disclose silica in any of the lists of reactants or in processes used to produce the desired products of the reference

In the Office action dated March 18, 2010, the examiner argued that Tomihisa teaches reaction of coupling agents "onto the silica as claimed". In the Amendment filed June 18, 2010 , Appellant rebutted the examiner's arguments by showing that Tomihisa does not disclose the use of silica particles per se as a starting material and that Tomihisa teaches away from using silica particles in the comparative examples.

In the Final rejection, the examiner took the position that Appellant's "claims are not drafted so as to limit the silica to be a starting material distinguished from the silica of the prior art" (page 3, lines 1-2). The examiner's contention is erroneous because Tomihisa does not disclose silica particles as starting materials. The starting materials of Tomihisa are polymers or polymerizable monomers having at least one polysiloxane group (col. 4, lines 23+). Claims 41 and 43 recite the use of silica particles. Therefore, the silica particles of Appellant's claims are distinct from the monomers/polymers having at least one polysiloxane group.

There is nothing in Tomihisa that teaches or suggests the use of silica particles to produce the desired compound fine particles. In fact, Tomihisa uses colloidal silica in the comparative examples in cols.39-42 and teaches that the desired products are not formed.

The products of claims 41 and 43 are not formed in the comparative examples since the examples do not use dihalide organic connecting materials and the reactions used therein are different from the reactions according to the claims.

Tomihisa teaches that 1) the compound fine particles include inorganic fine particles and an organic polymer, the organic polymer being bound to the surfaces of the inorganic fine particles and 2) that the compound fine particles are produced from hydrolysis/condensation of *polysiloxane* groups which are already bound to a polymer or polymerizable monomer (see also col. 6, lines 4-9 and col. 4, lines 24-34). As disclosed in Tomihisa and explained in the Declaration, the fine particles described by Tomihisa are obtained by 1) hydrolysis of polysiloxane groups which are attached to polymers or polymerizable monomers and then 2) condensation of the hydrolyzed polysiloxane groups to form aggregated inorganic fine particles having polymer chains attached to their surfaces.

Numerous compounds are disclosed as component G by Tomihisa. However, even if dihalide organic compounds are disclosed, the disclosure is not sufficient to support anticipation because the compounds disclosed by Tomihisa would form the aggregated product as shown in Appellant's Declaration. The fine particles produced by Tomihisa's hydrolysis/condensation reactions would be bonded through the M atom from component G. Tomihisa's particles are not connected by chains comprising carbon and hydrogen. The bridge chains formed by the reaction of the silica particles and connecting materials recited in claims 41 and 43 prevent aggregation of the particles by three dimensional network of the silica particles formed by bridge chains from the connecting materials as shown in Fig. 1.

Furthermore, Tomihisa does not teach the reaction of silica particles per se with the disclosed compounds to form the products desired by the reference. Specifically, Tomihisa does not teach the reaction of silica particles with dihalide connecting materials as recited in claims 41 and 43.

Rejection under 35 U.S.C. 103 as obvious over U.S. Patent No. 5,683,501 (Tomihisa)

The previous discussions of the rejection of claims 33 and 36 - 40 under 35 USC 103 are herein incorporated by reference. For the reasons discussed therein, Appellant's submit

that the disclosure of Tomihisa does not support the examiner's position that the products of the reference appear to be obvious variants of Appellant's claimed products of claims 41 and 43.

Although dihalide organic materials may be disclosed in the lengthy lists of components G and H in Tomihisa, there is no disclosure of connecting materials which would form the connecting chains containing carbon and hydrogen. The dihalide materials disclosed by Tomihisa would form the aggregated product as shown in Appellant's Declaration. The fine particles produced by Tomihisa's hydrolysis/condensation reactions would be bonded through the M atom from component G as discussed previously. Therefore, Tomihisa's particles are aggregated and are not connected by connecting chains comprising carbon and hydrogen. The bridge chains formed by the reaction of the silica particles and organic connecting materials recited in claims 41 and 43 do contain carbon and hydrogen atoms in the connecting material. The bridge chains prevent aggregation of the particles by three dimensional network of the silica particles formed by bridge chains from the connecting materials as shown in Fig. 1.

Furthermore, there is nothing in Tomihisa which would motivate one skilled in the art to select such a material and use it with silica particles in Tomihisa's process of producing the compound fine particles. On the contrary, Tomihisa teaches away from the use of silica particles in the comparative examples.

The examiner's rejections under 35 USC 103 must be reversed because he has failed to rebut or even address the evidence of nonobviousness in Appellant's Declaration and Tomihisa's comparative examples. As discussed previously, MPEP 2145 provides that:

> Office personnel should not evaluate rebuttal evidence for its "knockdown" value against the prima facie case, In re Piasecki, 745 F.2d at 1473, 223 USPQ at 788, or summarily dismiss it as not compelling or insufficient. If the evidence is deemed insufficient to rebut the prima facie case of obviousness, Office personnel should specifically set forth the facts *and reasoning* that justify this conclusion.

In the Final rejection, the examiner did not dispute that the comparative examples teach away from the use of silica particles as reactants because the examples show that

colloidal silica does not react with the polymer. Therefore, the examiner's argument that Tomihisa uses silica to produce a product which is the same as or similar to Appellant's claimed product is erroneous since Appellant's bridge chains are bonded to the silica particles.

With regard to the examiner's argument that silica particles are not set forth in Appellant's claims, it is noted that reaction 2) set forth in claims 41 and 43 recite silica particles as a reactant.

Tomihisa's comparative examples teach away from the use of silica or functionalized silica in the processes disclosed by the reference; teaching away is evidence of non-obviousness of Appellant's claimed invention

The arguments relating to Tomihisa's comparative examples which were presented against the obviousness rejection of claim 33 and 36 - 40 are herein incorporated by reference.

Tomihisa specifically teaches that the use of colloidal silica does not produce the desired products. In the comparative examples in col. 39-41, colloidal silica was treated with a silane coupling agent and used in reactions which are different from reaction 2) of claims 41 and 43. The products of the comparative examples are not the same as the claimed products because both an silane coupling agent and a dihalide organic connecting agent are not used and reactions in the comparative examples are different from the product of claims 41 and 43. Tomihisa specifically teaches that the polymer does not react with the silica particles and no alkoxy group was found on the particles. The comparative examples are evidence of non-obviousness of the above claims since Tomihisa teaches that the desired products are not obtained.

Appellant submits that Tomihisa's teaching away is evidence of non-obviousness of Appellant's claimed invention which has not been addressed or rebutted by the examiner. As noted previously, claims 41 and 43 recite silica particles reaction 2).

Tomihisa does not provide a sufficient basis for a reasonable expectation of success

The arguments presented against the obviousness rejections of claim 33 ad 36 - 40 in connection with reasonable expectation of success are herein incorporated by reference.

There is no reasonable expectation of success in using silica particles per se as starting material in the process of Tomihisa because the reference teaches away from the use of silica particles as starting materials in the Comparative examples. The reference specifically teaches that the polymer does not bond with the colloidal silica and that the resulting products are unsuitable for their intended use. Applicant's submit that such teachings are evidence of no reasonable expectation of success and that teaching away is evidence of non-obviousness of Applicant's claimed invention.

Although dihalide organic materials may be disclosed in the lengthy lists of components G and H in Tomihisa, there is no reasonable expectation of success of obtaining Appellant's claimed network of particles. There is no disclosure of connecting materials which would form the connecting chains containing carbon and hydrogen. The dihalide materials disclosed by Tomihisa would form the aggregated product as shown in Appellant's Declaration. The fine particles produced by Tomihisa's hydrolysis/condensation reactions would be bonded through the M atom from component G as discussed previously. Therefore, Tomihisa's particles are aggregated and are not connected by connecting chains comprising carbon and hydrogen. The bridge chains formed by the reaction of the silica particles and organic connecting materials recited in claims 41 and 43 do contain carbon and hydrogen atoms in the connecting material and prevent aggregation of the particles by three dimensional network of the silica particles formed by bridge chains from the connecting materials as shown in Fig. 1.

Group V: Claim 45

Claim 45 is directed to a three-dimensional network of silica particles wherein the silica particles are connected by bridge chains wherein the connecting chain is comprised of carbon and hydrogen and wherein the network of silica particles is produced by:

Reaction 3)

reacting silica particles functionalized with alkoxy silane coupling agents having functional groups with c) an organic connecting material wherein the connecting material is diamine, diisocyanate, or dihalide wherein the silica particles react with the diamine, dihalide, or diisocyanate groups of the connecting materials

wherein the connecting material is diamine, diisocyanate, or dihalide. Appellant elected the dihalide species for the organic connecting material.

Rejection under 35 U.S.C. 102 (b) as anticipated by U.S. Patent No. 5,683,501 (Tomihisa)

The previous discussions of the rejection of claims 33, 36 - 41 and 43 under 35 USC 102 are herein incorporated by reference. For the reasons discusses therein, Appellant's submit that the disclosure of Tomihisa does not support the examiner's position that the products of the reference appear to be the same as Appellant's claimed product in claim 45.

As discussed previously, Tomihisa does not specifically disclose any compound fine particles made from silica particles functionalized with alkoxy silane coupling agents as set forth in claim 45. In the claim, silica particles functionalized with alkoxy silane coupling agents are used as starting materials. Moreover, the functionalized silica particles are made using silica particles as starting materials so the reaction set forth in the above claims inherently use silica particles as a starting material.

Although alkoxy silane coupling agents having functional groups and organic dihalide connecting materials may be disclosed in the lengthy lists of components G and H in Tomihisa, there is nothing in Tomihisa which teaches or suggests the use of an alkoxy silane coupling agent having functional groups together with a dihalide organic connecting material in the processes disclosed by Tomihisa. Appellant submits that a lengthy list of alkoxy silane coupling agents and organic materials with two functional groups is not sufficient to support anticipation of a product which is made by reacting functionalized silica particles with the dihalide organic connecting materials as recited in claim 45.

As discussed in connection with claim 33, 36 - 41, and 43, the functional groups on Tomihisa's component G and the groups on the polysiloxane groups are hydrolyzed to form

OH groups which are condensed to form the aggregated inorganic fine particles. Therefore, even if more than one component G or H were used in the process of Tomihisa, they would not react with each other's functional groups because these groups would be hydrolyzed for condensation with the hydrolyzed polysiloxane group. Therefore, Appellant's bridge chains formed from the reaction of the coupling agent and the organic connecting material would not be formed.

None of the products specifically disclosed in Tomihisa's examples disclose a product which appears to be the same as Appellant's claimed product. The processes of Tomihisa include the first step of making the organic polymer containing polysiloxane groups which must be subjected to hydrolysis and condensation to produce the compound fine particles. The examples beginning in col. 28 of Tomihisa designated by "Z" disclose several processes and reactants. None of the examples disclose or suggest the use of the reactants set forth in claims 41 and 43. As explained on page 5 of the Declaration, Tomihisa's condensation reaction results in aggregated silica fine products having polymer chains bound to their surfaces. The product of claim 45 is not aggregated because of the network formed by connecting the silica particles with the alkoxy silane coupling agent and organic connecting material as recited in the claim.

As discussed previously for claim 33, 36 - 41, and 43, the polymers are not "readable on" Appellant's bridge chains. Claim 45 uses silica particles functionalized with alkoxy silane coupling agent and a dihalide organic connecting material and the bridge chains are formed by reaction of the functional groups on the coupling agent and connecting material. The bridge chains formed by the functional groups on the alkoxy coupling agents and organic connecting material are *not* polymeric. The bridge chains are chains whose length is determined by the alkyl group connected to the Si atom and the length of the connecting material. Therefore, Tomihisa's polymers are not "readable on" Appellant's bridge chains resulting from the reaction set forth in claim 45.

The reaction recited in claim 45 results in carbon and hydrogen atoms in the chain connecting the silica particles. The connecting chain is formed by the organic groups in the coupling agent and the connecting material. The alkoxy silane coupling agents and

connecting materials contain alkyl groups which become part of the connecting chain between the silica particles as a result of reaction 2) (paragraph [0029] of the published application).

As shown in Appellant's Declaration, the fine particles produced by Tomihisa's hydrolysis/condensation reactions are directly connected or, if component G is used, by bonding through M by O - M - O - atoms from component G. Tomihisa's particles are not connected by chains comprising carbon and hydrogen. The direct bonding or bonding through the metal atom causes the aggregation of the particles of Tomihisa. The bridge chains formed by the reaction of the functional groups of the coupling agents and connecting materials recited in claim 45 prevent aggregation of the particles by forming a three dimensional network of the silica particles as shown in Fig. 1.

Tomihisa does not disclose silica reacted with coupling agents in the processes used to produce the desired products of the reference

In the Office action dated March 18, 2010, the examiner argued that Tomihisa teaches reaction of coupling agents "onto the silica as claimed". In the Amendment filed June 18, 2010, Appellant rebutted the examiner's arguments by showing that Tomihisa does not disclose the use of silica particles per se as a starting material and that Tomihisa teaches away from using silica particles in the comparative examples.

In the Final rejection, the examiner took the position that Appellant's "claims are not drafted so as to limit the silica to be a starting material distinguished from the silica of the prior art" (page 3, lines 1-2). The examiner's contention is erroneous because the prior art, Tomihisa, does not disclose silica particles as starting materials. The starting materials of Tomihisa are polymers or polymerizable monomers having at least one polysiloxane group (col. 4, lines 23+). Therefore, the functionalized silica particles of claim 45 is distinct from the monomers/polymers having at least one polysiloxane group.

There is nothing in Tomihisa that teaches or suggests the use of functionalized silica particles to produce the desired compound fine particles. In fact, Tomihisa uses colloidal silica and colloidal silica with alkoxy silane coupling agents in the comparative examples in cols. 39 - 42 and teaches that the desired products are not formed. The product of claim 45

is not formed in the comparative examples since the examples do not use dihalide organic connecting materials and the reactions used therein are different from the reactions according to the claims.

The fine particles described by Tomihisa are obtained by 1) hydrolysis of polysiloxane groups which are attached to polymers or polymerizable monomers and then 2) condensation of the hydrolyzed polysiloxane groups optionally with component G. Numerous compounds are disclosed as component G by Tomihisa. However, these disclosures are not sufficient because Tomihisa does not teach the reaction of functionalized silica particles with any of the disclosed compounds to form the products desired by the reference. Specifically, Tomihisa does not teach the reaction of functionalized silica particles with dihalide connecting materials as recited in claim 45.

Rejection under 35 U.S.C. 103 as obvious over U.S. Patent No. 5,683,501 (Tomihisa)

The previous discussions of the rejection of claims 33, 36 - 41, and 43 under 35 USC 103 are herein incorporated by reference. For the reasons discussed therein, Appellant's submit that the disclosure of Tomihisa does not support the examiner's position that the products of the reference appear to be obvious variants of Appellant's product of claim 45.

Although the coupling agents having the recited functional groups may be disclosed in the lengthy lists of components G and H in Tomihisa, there is nothing in Tomihisa which would motivate one skilled in the art to select an alkoxy silane coupling agents having functional groups and combine the agent with a dihalide compound in the list for use in the process of producing the inorganic fine particles.

Even if an alkoxy silane coupling agent and dihalide compound were used in the process of Tomihisa, the functional groups on both would be hydrolyzed as shown on page 5 of Appellant's Declaration. Once the functional groups are hydrolyzed, they not react with each other to form the bridge chains of claim 45. Instead, they would form the aggregated product as explained in Appellant's Declaration. The aggregated particles would be bonded through the metal atom in the agent or compound used as component G instead of the carbon and hydrogen containing connecting chains of claim 45.

As discussed previously for claim 33, the polymers are not "readable on" Appellant's bridge chains. Claim 45 uses silica particles functionalized with alkoxy silane coupling agents and a dihalide organic connecting material and bridge chains are formed by reaction of the functional groups on the coupling agent and connecting material. As discussed above, the bridge chains formed by the reaction of the functional groups on the alkoxy coupling agent and connecting material are *not* polymeric. The bridge chains are monomeric chains whose length is determined by the alkyl groups connected to the Si atom. Therefore, Tomihisa's polymers are not "readable on" Appellant's bridge chains resulting from the reactants and reaction set forth in claim 45.

Tomihisa's comparative examples teach away from the use of silica or functionalized silica as a reactant; teaching away is evidence of non-obviousness of Appellant's claimed invention

The arguments relating to Tomihisa's comparative examples which were presented against the obviousness rejection of claim 33, 36, 37, and 39 - 41, and 43 are herein incorporated by reference.

Tomihisa specifically teaches that the use of colloidal silica or colloidal silica with a silane coupling agent does not produce the desired products. In the comparative examples in col. 39 - 41, colloidal silica was treated with a silane coupling agent and used in reactions which are different from reaction 3) of claim 45. Comparative examples 2, 4, and 5 disclose alkoxy silane coupling agent which are used in different reactions. In these examples, only one silane coupling agent is used without any dihalide connecting materials. The products of the comparative examples are not the same as the claimed products because no dihalide connecting material is used and reactions in the comparative examples are different from the product of claim 45. Tomihisa specifically teaches that the polymer does not react with the silica particles and no alkoxy group was found on the particles. The comparative examples are evidence of non-obviousness of the above claims since Tomihisa teaches that the desired products are not obtained.

Appellant submits that Tomihisa's teaching away is evidence of non-obviousness of Appellant's claimed invention which has not been addressed or rebutted by the examiner.

As noted previously, Appellant's claims recite silica particles per se or functionalized silica particles. The functionalized particles are derived from silica particles so all of Appellant's reactions use silica particles as starting materials.

Tomihisa does not provide a sufficient basis for a reasonable expectation of success

The arguments presented against the obviousness rejections of claim 33, 36 - 41, and 43 are herein incorporated by reference. If an alkoxy silane coupling agent and dihalide connecting material were selected from the lengthy list of Tomihisa, the functional groups would be hydrolyzed as shown on page 5 of Appellant's Declaration. Once the functional groups are hydrolyzed, they would not react with each other to form bridge chains. Instead, they would form the aggregated silica particles shown in Appellant's Declaration.

For the reasons discussed herein, Appellant submits that the examiner erred in rejecting the claims under 35 U.S.C. §102 as anticipated by or, in the alternative, under §103. The reference cited by the examiner did not provide evidence to support either rejection. The examiner did not provide adequate technical reasoning to support anticipation by inherency and did not provide adequate legal and/or technical reasoning to support a prima facie case of obviousness. The examiner did not properly consider evidence of non-obviousness in the reference and Appellant's Declaration.

Appellant request that the Board reverse the Final rejection of claims 33, 36 - 41, 43, and 45.

Respectfully submitted,

SEO ET AL

BY 

Maria Parrish Tungol
Registration No. 31,720
Telephone: (571) 969-5585

CLAIMS APPENDIX

Claim 33. A three-dimensional network of silica particles wherein the silica particles are connected by bridge chains wherein the connecting chain is comprised of carbon and hydrogen and wherein the network of silica particles are produced by:

1) reacting

a1) silica particles functionalized with alkoxy silane coupling agents having functional groups with

b) silica particles functionalized with alkoxy silane coupling agents having different functional groups so that the functional groups of a1) and b) are covalently bonded

or

2) reacting silica particles with an organic connecting material wherein the connecting material is diamine, dihalide, or diisocyanate wherein the silica particles react with the diamine, dihalide, or diisocyanate groups of the connecting materials

or

3) reacting silica particles functionalized with alkoxy silane coupling agents having functional groups with c) an organic connecting material wherein the connecting material is diamine, diisocyanate, or dihalide wherein the silica particles react with the diamine, dihalide, or diisocyanate groups of the connecting materials .

Claim 36. Networked silica particles according to claim 33 which are connected by reaction 1) wherein the functional groups of a1) are amine or imine groups and the functional groups of b) are mercapto groups.

Claim 37. Networked silica particles according to claim 33 which are connected by reaction 1) wherein the functional groups of of a1) are amine or imine groups and the functional groups of b) are glycidyl groups.

Claim 38. Networked silica particles according to claim 33 which are connected by reaction 1) wherein the coupling agent of a1) is 3-aminopropyltriethoxy silane and the coupling agent of b) is 3-glycidyloxypropyltrimethoxy silane.

Claim 39. Networked silica particles according to claim 33 which are connected by reaction 1) wherein the functional groups of a1) are amine groups and the functional groups of b) are halide groups.

Claim 40. Networked silica particles according to claim 33 which are connected by reaction 1) wherein the functional groups of a1) are 3-aminopropyltriethoxy silane and the functional groups of b) are 3-chloropropyltrimethoxy.

Claim 41. Networked silica particles according to claim 33 which are connected by reaction 2) wherein the connecting material is diamine, diisocyanate, or dihalide.

Claim 43. Networked silica particles according to claim 41 which are connected by reaction 2) wherein the connecting material is dichloride.

Claim 45. Networked silica particles according to claim 41 which are connected by reaction 3) wherein the connecting material is diamine, diisocyanate, or dihalide.

EVIDENCE APPENDIX

DECLARATION

I, Gon Seo, am the applicant in Serial No. 10 535 153 and hereby declare that:

I have reviewed the specification, including the claims, of Serial No. 10535 153, the Office action mailed March 18, 2010, and U.S. 6,638,501, Tomihisa et al. ("Tomihisa"), cited by the examiner;

Based on my review of Tomihisa, I have concluded that the products disclosed in Tomihisa are not the same as the three dimensional network of silica particles according to the present claims in the above application. Based on my review, I have also concluded that the three dimensional network of silica particles according to the present claims in the above application are not obvious variants of the products disclosed in Tomihisa;

The "three-dimensional network" disclosed in col. 6 of Tomihisa refers to the configuration of atoms, not particles. There is nothing in Tomihisa that teaches that the inorganic fine particles are in a three dimensional network. Furthermore, the inorganic fine particles of the reference are not connected to each other by bridge chains containing carbon and hydrogen atoms;

Silica particles are not used as a starting material for the inorganic fine particle or the compound fine particle of Tomihisa. The lists of metallic compounds do not include silica. The inorganic silica fine particles are generated by hydrolysis-condensation of the alkoxysilane groups on the polymers alone or together with a metallic compound of the formula (RO)MR1. As illustrated hereafter, the general reaction sequence of hydrolysis and condensation of the organic polymer results in inorganic fine particle aggregates in the compound fine particles;

A three dimensional network of silica particles is not formed if a polymeric material is used as the material bonded to the silica particle because of the steric effects of the size of the polymeric material. The size of the polymeric material is much larger than the size of bridge chains which are derived from alkoxy silane coupling agents and specified difunctional connecting materials;

The silica particles in the claimed network are not aggregated (paragraph [0027], lines 17+ of the published application). In the three dimensional network of silica particles of Applicant's claims, the silica particles are interconnected in a three dimensional network by bridge materials as illustrated by Fig. 1 of the above application;

Polymers such as those disclosed in Tomihisa would not produce the three dimensional networked silica particles of the present claims because the reference teaches that the polymers do not bond with colloidal silica particles. Based on my technical review of the disclosure, including the examples, of Tomihisa, I have concluded that the polymer chains have a masking effect on the inorganic fine particles which would prevent the formation of three dimensional networks of the inorganic fine particles or compound fine particles;

The three dimensional network according to the present claims provides voids and openings to entangle rubber molecule when the networked silica particles are used in rubber compositions. The polymer chains in Tomihisa would be expected to prevent formation of a three dimensional network of the inorganic fine particles because of steric effects of the long chains which mainly cover the inorganic fine particles;

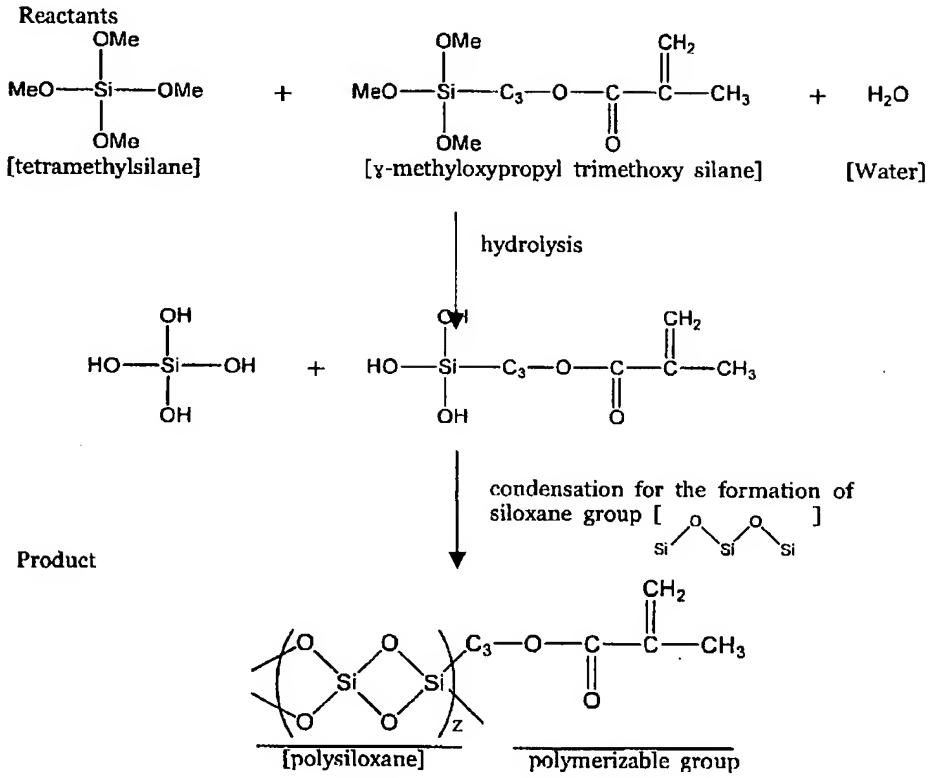
The reaction sequence on the following pages illustrates the general hydrolysis and condensation reactions in Tomihisa. The sequence follows the sequence in Tomihisa's examples beginning with the preparation of a polymerizable polysiloxane, S, and the use of this product to produce the organic polymer, P, and then hydrolysis and condensation reactions for preparation of the compound fine particles;

Based on my review of Tomihisa, I have concluded that the use of the organic polymer results in silica aggregates in the compound fine particles. The silica particles in the presently claimed network are not aggregated (paragraph [0027], lines 17+ of the published application). In the three dimensional network of silica particles of the present claims, the silica particles are interconnected by bridge chains as illustrated by Fig. 1 of the above application.

The three dimensional network of silica particles according to the present claims results from the use of silica particles as the starting material which are then reacted with organic bridging materials comprised of carbon and hydrogen. The network formed among the silica particles prevent their aggregation (paragraph [0020]);

The bridge chains of the claimed networks are comprised of carbon and hydrogen. As shown in the following reaction sequence, the aggregated inorganic fine particles of Tomihisa are bonded by silicon-oxygen bonds which do not contain either carbon or hydrogen;

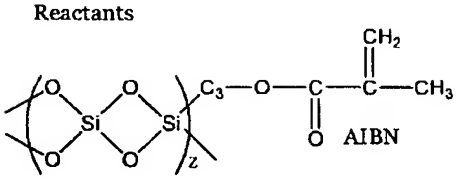
I. Preparation of polymerizable polysiloxane [S-1 ~ S-4]

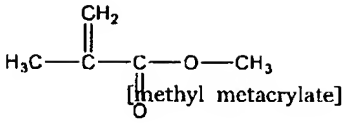


polymerizable polysiloxane

II. Preparation of organic polymer [P-1 ~ P-14]

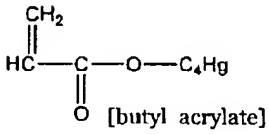
Reactants





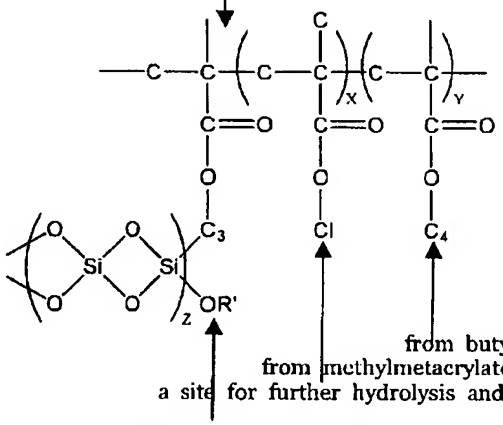
+ [initiator]

+



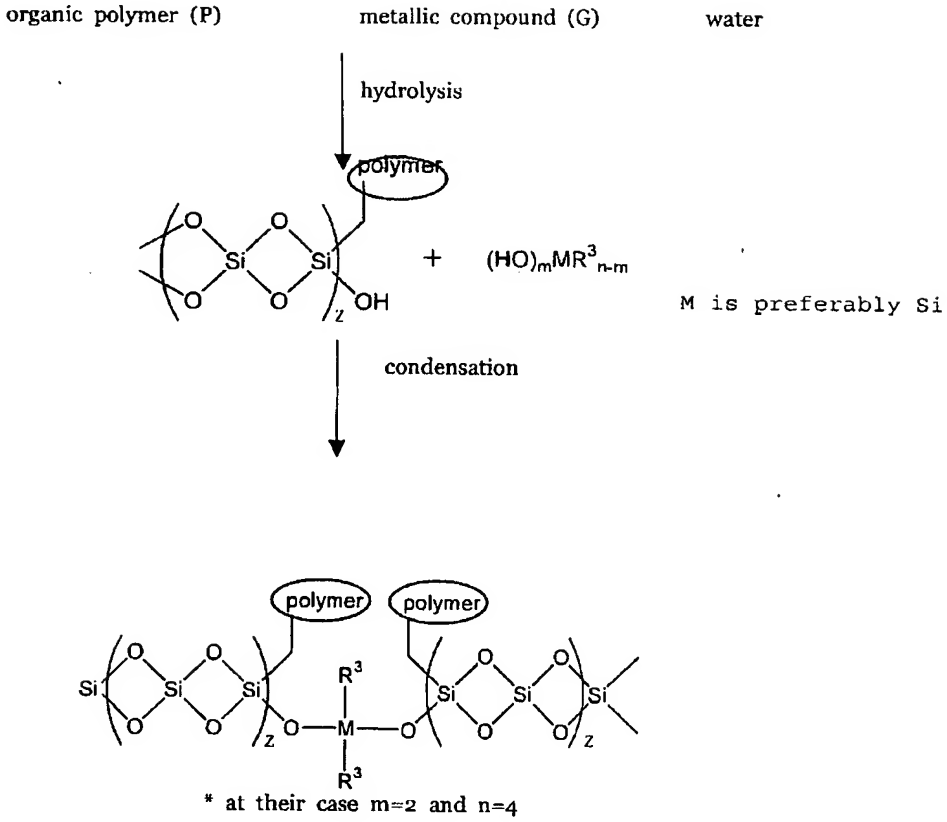
polymerization

Product

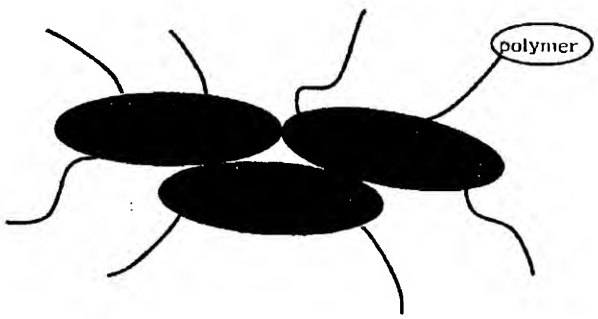


organic polymer (P)

III. Preparation of compound fine particles



The final product



aggregated silica fine particles with Si-O bonds

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity or the application or any patent issuing thereon.

June 25, 2010
Date

/Seo Gon/
Gon SEO

RELATED PROCEEDINGS APPENDIX

NONE